

STUDY LINK
8•13
Unit 9: Family Letter


More about Variables, Formulas, and Graphs

You may be surprised at some of the topics that are covered in Unit 9. Several of them would be traditionally introduced in a first-year algebra course. If you are assisting your child, you might find it useful to refer to the *Student Reference Book* to refresh your memory.

Your child has been applying many mathematical properties, starting as early as first grade. In Unit 9, the class will explore and apply one of these properties, the distributive property, which can be stated as follows:

For any numbers a , b , and c , $a * (b + c) = (a * b) + (a * c)$.

Students will use this property to simplify algebraic expressions. They will use these procedures, together with the equation-solving methods that were presented in Unit 6, to solve more difficult equations that contain parentheses or like terms on at least one side of the equal sign. Here is an example:

To solve the equation $5(b + 3) - 3b + 5 = 4(b - 1)$,

1. Use the distributive property to remove the parentheses.

$$5b + 15 - 3b + 5 = 4b - 4$$

2. Combine like terms.

$$2b + 20 = 4b - 4$$

3. Solve the equation.

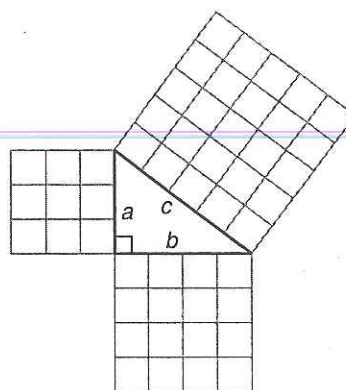
$$20 = 2b - 4$$

$$24 = 2b$$

$$b = 12$$

Much of Unit 9 also focuses on applying formulas—in computer spreadsheets and in calculating the areas of circles, rectangles, triangles, and parallelograms, the perimeters of polygons, and the circumferences of circles. Students will also use formulas for calculating the volumes of rectangular prisms, cylinders, and spheres to solve a variety of interesting problems.

Finally, your child will be introduced to the Pythagorean theorem, which states that if a and b are the lengths of the legs of a right triangle and c is the length of the hypotenuse, then $a^2 + b^2 = c^2$. By applying this theorem, students will learn how to calculate long distances indirectly—that is, without actually measuring them.



Please keep this Family Letter for reference as your child works through Unit 9.

Vocabulary

Important terms in Unit 9:

combine like terms To rewrite the sum or difference of *like terms* as a single term. For example, $5a + 6a$ can be rewritten as $11a$, because $5a + 6a = (5 + 6)a = 11a$. Similarly, $16t - 3t = 13t$.

Distributive Property of Multiplication over Addition A property relating multiplication to a sum of numbers by distributing a factor over the terms in the sum.

For example, $2 * (5 + 3) = (2 * 5) + (2 * 3) = 10 + 6 = 16$.

In symbols: For any numbers a , b , and c :

$$a * (b + c) = (a * b) + (a * c),$$

$$\text{or } a(b + c) = ab + ac$$

Distributive Property of Multiplication over Subtraction A property relating multiplication to a difference of numbers by distributing a factor over the terms in the difference.

For example, $2 * (5 - 3) = (2 * 5) - (2 * 3) = 10 - 6 = 4$.

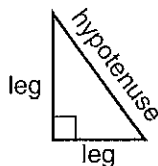
In symbols: For any numbers a , b , and c :

$$a * (b - c) = (a * b) - (a * c),$$

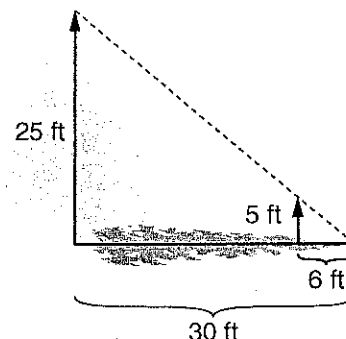
$$\text{or } a(b - c) = ab - ac$$

equivalent fractions Fractions with different denominators that name the same number.

hypotenuse In a right triangle, the side opposite the right angle.



indirect measurement The determination of heights, distances, and other quantities that cannot be directly measured.

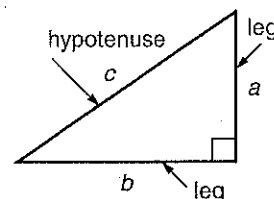


Indirect measurement lets you calculate the height of the tree from the other measure.

leg of a right triangle Either side of the right angle in a right triangle; a side that is not the *hypotenuse*.

like terms In an algebraic expression, either the constant terms or any terms that contain the same variable(s) raised to the same power(s). For example, $4y$ and $7y$ are like terms in the expression $4y + 7y - z$.

Pythagorean theorem If the *legs* of a right triangle have lengths a and b and the *hypotenuse* has length c , then $a^2 + b^2 = c^2$.



simplify an expression To rewrite an expression by clearing grouping symbols and combining *like terms* and constants.

Do-Anytime Activities

To work with your child on the concepts taught in this unit and previous units, try these interesting and rewarding activities:

1. To practice simplifying expressions and solving equations, ask your child to bring home the game materials for *Algebra Election*. Game directions are in the *Student Reference Book*.
2. If you have any mobiles in your home, ask your child to explain to you how to perfectly balance one. Have your child show you the equations he or she used to balance it.
3. Your child may need extra practice with the partial-quotients division algorithm. Have him or her show you this method. Provide a few problems to practice at home, and have your child explain the steps to you while working through them.

As You Help Your Child with Homework

As your child brings assignments home, you may want to go over the instructions together, clarifying them as necessary. The answers listed below will guide you through some of the Unit 9 Study Links.

Study Link 9•1

1. a. $(8 * 4) + (7 * 4)$
 $4 * (7 + 8)$
c. $(4 + 9) * 3$
 $(9 * 3) + (4 * 3)$
2. a. 6
b. $(9 - 3) * 5 = 30$ $(9 * 5) - (3 * 5) = 30$
3. a. N b. O c. O
d. N e. P f. O
4. 3.92 $(8 * 0.10) + (8 * 0.39) = 3.92$

Study Link 9•2

1. a. $(7 * 3) + (7 * 4)$
b. $(7 * 3) + (7 * \pi)$
c. $(7 * 3) + (7 * y)$
d. $(7 * 3) + (7 * (2 * 4))$
e. $(7 * 3) + (7 * (2 * \pi))$
f. $(7 * 3) + (7 * (2 * y))$
2. b. $(20 * 42) - (20 * 19) = 840 - 380 = 460$
c. $(32 * 40) + (50 * 40) = 1,280 + 2,000 = 3,280$
d. $(90 * 11) - (8 * 11) = 990 - 88 = 902$
e. $(9 * 15) + (9 * 25) = 135 + 225 = 360$
3. a. $(80 * 5) + (120 * 5) = (80 + 120) * 5$
c. $12(d - t) = 12d - 12t$
d. $(a + c) * n = (a * n) + (c * n)$
f. $(9 * \frac{1}{2}) - (\frac{1}{3} * \frac{1}{2}) = (9 - \frac{1}{3}) * \frac{1}{2}$
4. 3 5. $\frac{11}{14}$ 6. $\frac{8}{57}$

Study Link 9•3

1. $15x$ 2. $\frac{3}{10}y$ 3. $-11t$ 4. d
 5. -6 6. $3p$ 7. -3 8. 8.3
 9. $7b + 14$ 10. $1\frac{1}{6}a + \frac{1}{4}t$
 11. -53 12. 23 13. 132 14. -19

Study Link 9•4

1. $45f + 109$ 2. $12m$ 3. $32k + 44$
 4. $-y + 2b + 24$
 5. $65,800$ 6. 0.2348 7. 0.5163 8. 0.0796

Study Link 9•5

Column 1

A. $4x - 2 = 6$
 Solution: $x = 2$

B. $3s = -6$
 Solution: $s = -2$

C. $3y - 2y = y$
 Solution: $y =$
 any number

D. $5a = 7a$
 Solution: $a = 0$

1. 2^5 2. 10^2 3. 5^4 4. 4^1

Column 2

C $6j + 8 = 8 + 6j$

A $2c - 1 = 3$

B $6w = -12$

C $\frac{2h}{2h} = 1$

A $\frac{3q}{3} - 6 = -4$

A $3(r + 4) = 18$

C $2(5x + 1) = 10x + 2$

A $-5x - 5(2 - x) = 2(x - 7)$

D $s = 0$

B $5b - 3 - 2b = 6b + 3$

B $\frac{t}{4} + 3 = 2\frac{1}{2}$

A $6z = 12$

D $2a = (4 + 7)a$

Study Link 9•6

1. 7 2. 38 3. 4 4. 2
 5. $23 + 14y$ 6. $-2b + 32$
 7. $3f - 55 - 10k$ 8. $225 + 35g$
 9. $r + 23$ 10. $4b + 72; 72 - (-4b)$
 11. $W = 5b; D = 4; w = 30; d = 12$

Equation: $5b \cdot 4 = 30 \cdot 12$; Solution: $b = 18$
 Weight of the object on the left: 90

12. $5\frac{11}{24}$ 13. 92 14. $5\frac{5}{7}$

Study Link 9•7

3. 2.7 feet

Study Link 9•8

1. 112 in.^2 2. 2.5 ft^2 3. 108 cm^2
 4. 45.5 mm^2 5. 55 ft^2 6. 696 m^2
 7. $a \cdot b$ 8. $(n + m) \cdot y$
 9. 63.6 10. 0.1

Study Link 9•9

1. 120 in.^3 2. 904.32 in.^3 3. 11.97 in.^2
 4. 10.4 m^3 5. $3,391 \text{ yd}^2$ 6. 3.22 ft^3
 7. 95 8. 37.8 9. $1,400$

Study Link 9•10

1. Answers vary. 2. Answers vary.
 3. 13.48 4. 17.62

Study Link 9•11

1. a. $C = \frac{5}{9} * (77 - 32)$; 25°C
b. $50 = \frac{5}{9} * (F - 32)$; 122°F
2. a. $A = \frac{1}{2} * 17 * 5$; 42.5 cm^2
b. $90 = \frac{1}{2} * 12 * h$; 15 in.
3. a. $V = \frac{1}{3} * \pi * 4 * 9$; 37.68 in.^3
b. $94.2 = \frac{1}{3} * \pi * 9 * h$; 10 cm

Study Link 9•12

- | | | | |
|-------------------|----------|------------|-----------|
| 1. 12 | 2. 200 | 3. 30 | 4. 0.4 |
| 5. $\frac{5}{11}$ | 6. 100 | 7. 3.46 | 8. 7.14 |
| 9. 7.94 | 10. 25 m | 11. 9.8 ft | 12. 22 yd |
13. 127.3 ft
14. 18 15. 23

Study Link 9•13

1. a. $7x$ b. $4x + 7$ c. $6x + 2$ d. 6
2. Sample answer: Liani did not multiply 10 by 8.
The simplified expression should be $8x + 80$.
3. a. $x = -10$ b. $g = -5$
c. $y = 4$ d. $x = 14$
4. Length of \overline{AB} : 5 in.; Length of \overline{BC} : 8 in.;
Length of \overline{AC} : 5 in.
5. 6 cm^2
6. 4 blocks
7. 1.5 8. 1.75 9. 0.6

